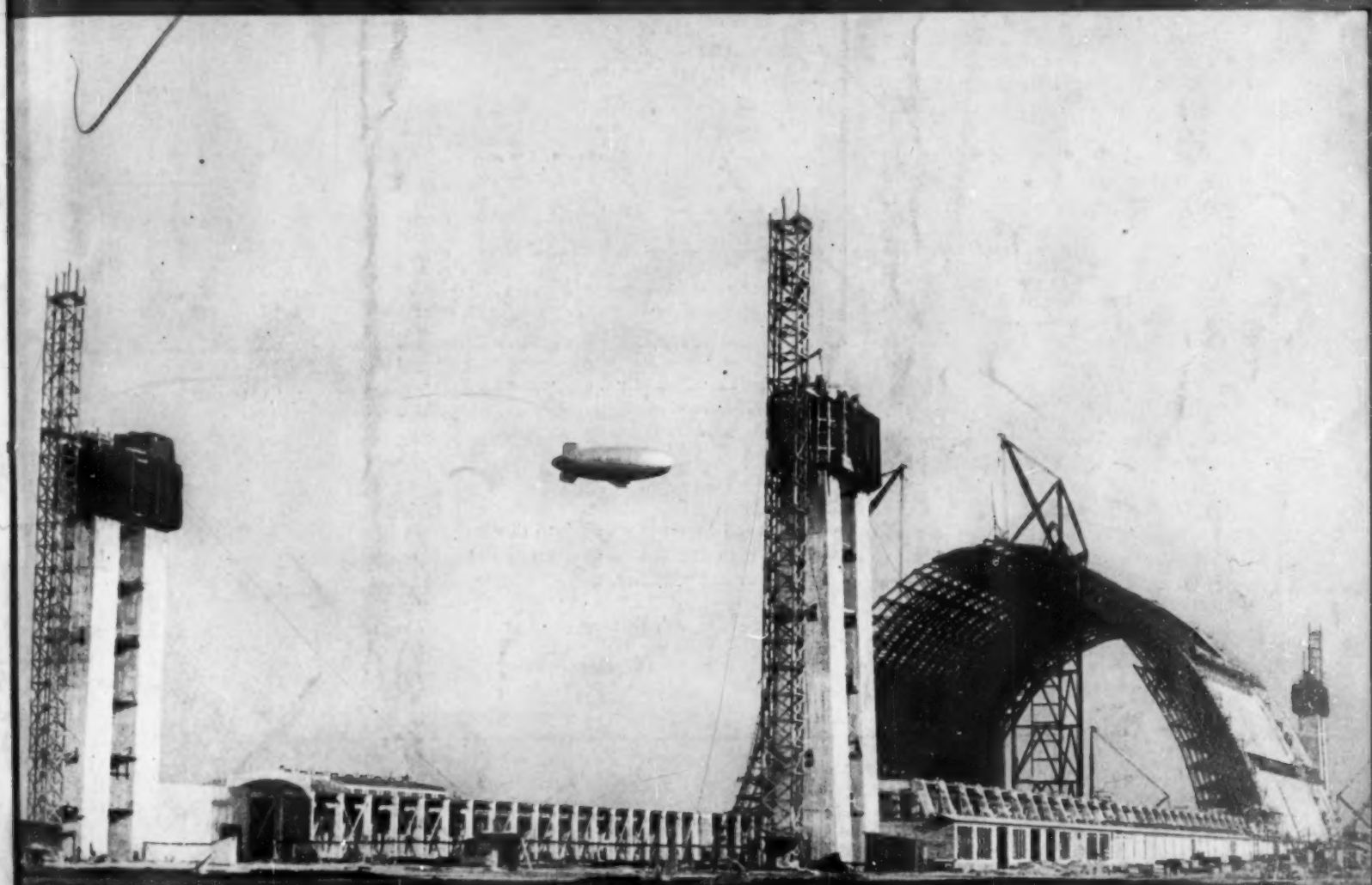
TECHNOLOGY DEPT.

SCIENCE NEWS LETTER

THE WEEKLY SUMMARY OF CURRENT SCIENCE • MARCH 20, 193



Wood for Steel

See Page 195

A SCIENCE SERVICE PUBLICATION

Do You Know?

Forest-fire prevention is an important element in war activities.

Ethyl acetate and dibutyl phthalate, added to *fuel oil,* prevent the formation of gum on the burner.

The *balsa* tree, the wood of which is lighter than cork, is a fast-grower and often reaches a height of 40 feet in seven years.

Cigarette consumption accounted for but a small portion of the tobacco crop prior to World War I; now it uses 80% of the crop.

Uncorrected *visual defects,* that would cause productive deficiency, have been found in one person out of every four applying for work in certain factories.

Power plants on U. S. Reclamation Service irrigation projects in 11 western states produced last year more than seven and a quarter billion kilowatt hours of electrical energy.

There is less danger from *avian leucosis,* a poultry disease that kills annually a large number of birds, if young chicks are kept away from hens and on ranges not used for poultry for at least two years.

About 500 B.C., Nabu-rimannu, a *Chaldean* astronomer, calculated from data that had been collected on the motions of the sun and moon, that a year was 365 days, 6 hours, 15 minutes, and 41 seconds.

Question Box

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Most articles which appear in SCIENCE NEWS LETTER *are based on communications to Science Service, or on papers before meetings. Where published sources are used they are referred to in the article.*

Women make excellent *dimplers:* dimpling, as well as welding and riveting, is an important operation in aircraft making.

Approximately 60% of the *paint* made in the United States is going into direct war service in the Armed Forces or in their supporting agencies.

The *swordfish,* which meets the standard engineering requirements for streamlined forms, is probably the fastest swimming creature in the world.

It costs more to transmit *electrical power* over 300 miles than it does to generate the power locally with steam or diesel engines.

Machine operators working on black shoes in a factory suffer less from *headaches* and blind spots when the machines are painted white.

The war has created a demand for certain products of *Peru,* including sugar, copper, petroleum, flax, barbasco, quinine and rubber.

SCIENCE NEWS LETTER

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MEDICINE

Immersion Foot Prevented

New treatment developed in Canada saves from amputation nearly all the survivors from torpedoed ships. Grease a preventive.

➤ SUCCESSFUL METHODS for preventing and treating a serious war ailment of shipwreck victims, immersion foot, have been developed by three Royal Canadian Naval Medical Officers, the War Information Board of Canada announces. The three doctors are Surg. Cdr. D. R. Webster, Surg. Lieut. F. M. Woolhouse and Surg. Lieut. J. L. Johnston.

Of 150 survivors of torpedoed vessels they treated at an eastern Canadian port, only seven required amputation of the affected foot. By contrast, nearly all survivors picked up by trawlers from one internationally known ship which was sunk in European waters had to have their feet amputated.

Immersion foot is caused usually by exposure in life rafts or boats for long periods and if not properly treated is likely to result in gangrene, requiring amputation to save the victim's life.

The rules for prevention of the condition are: 1. Cover legs and feet with a thick coating of grease as long distance swimmers do; 2. Remove any constricting clothing such as tight boots which are of no use for warmth if the feet are in water anyway; 3. Exercise the feet as much as possible, to keep the blood circulating, as long as they are healthy.

The great tragedy of many immersion foot victims is that rescuers in giving treatment to survivors of ship sinkings usually give the wrong treatment which causes the patient intense suffering and even loss of one or both feet. Rubbing the feet and applying hot water bottles and blankets is exactly the wrong treatment.

First aid rules for this condition are: 1. Keep the patient dry and warm except for his feet; 2. Lightly dust sulfanilamide powder on any wounds, cuts or sores; 3. Wrap the legs in some soft clean material and elevate on pillows; 4. Leave further treatment for a doctor who should be seen as soon as possible. No washing, soaking, antiseptics, lotions or ointments, except the sulfanilamide powder, should be used. The patient must not stand or walk, and his feet and legs must be handled gently.

Survivors treated in the port had their feet wrapped in sterile towels to keep them dry, and packed in ice, or kept under a blast of cool air from a fan, because the success of the treatment of immersion foot depends on bringing the affected parts back to normal temperature very slowly, over a period of weeks.

Science News Letter, March 20, 1943

MEDICINE

Gonorrhea and Chancroid Wiped Out by Sulfa Pills

➤ A "PHENOMENAL disappearance" of gonorrhea and chancroid in a company of troops given sulfathiazole pills as prophylaxis against these two venereal diseases is reported by Capt. James A. Loveless, venereal disease control officer, and Col. William Denton, post surgeon, at Fort Benning, Ga. (*Journal, American Medical Association,* March 13).

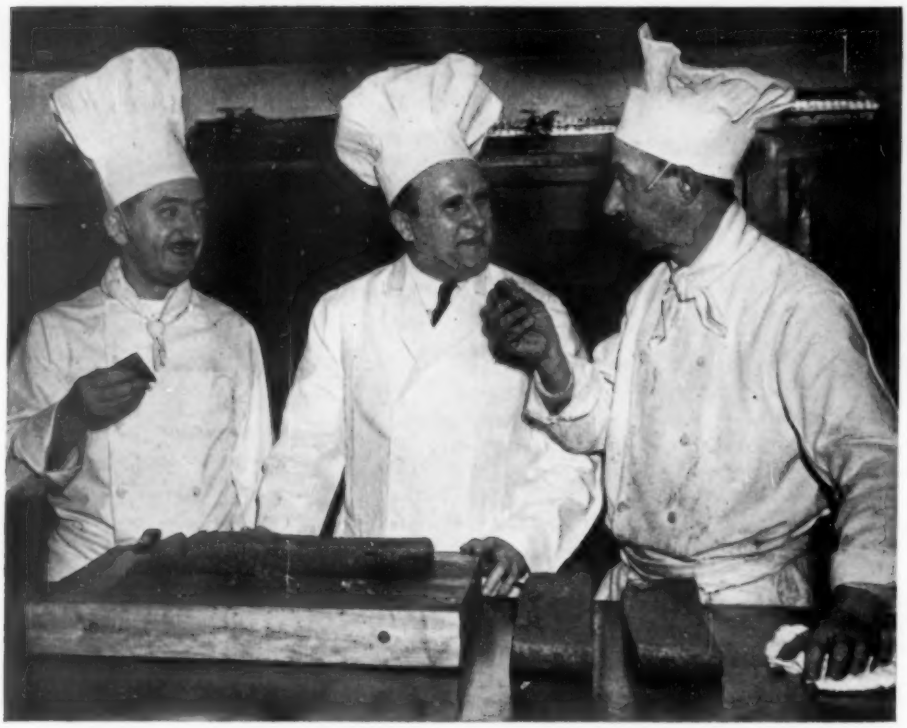
The method used, which the Army doctors say may need modification and simplification, was to give sulfathiazole to each man in the company leaving the fort on pass. Those taking station prophylaxis received no other drug. All the others received a second dose of sulfathiazole on returning to the fort and a third dose the following morning.

Excluding the men away from the camp on overnight leave or furlough, who would not be able to get the second and third doses of sulfathiazole, the gonorrhea rate dropped to a level of 8 per 1,000 yearly as compared with 171 per 1,000 in a control group of men not getting sulfathiazole, and the chancroid rate dropped to 6 as compared with 52. Syphilis was unaffected. The company in the study was from troops among whom the gonorrhea rate is inordinately high.

The cost of this prophylaxis was about 10 cents per soldier monthly. There were no bad reactions to the sulfathiazole but the doctors are continuing to watch the group for signs of sensitivity to the drug.

Science News Letter, March 20, 1943

HOVERING—This is the way a message can be picked up by the Sikorsky helicopter developed and constructed for the U. S. Army.



LEND-LEASE FOOD—Chefs at the new Statler Hotel in Washington, sample the meatloaf they have prepared from compressed dehydrated food for the Lend-Lease anniversary celebration.

NUTRITION

"Square Meals" Literally

Lend-Lease Administration demonstrates the compact little blocks of compressed dehydrated foods that are going to hungry Europe.

➤ BORTSCH for the fighters of Russia —enough to make two good helpings packed into a little block no bigger than a safety-match box—featured a demonstration of the newest things in space-saving shipping, put on by the Lend-Lease Administration to mark the second anniversary of the Lend-Lease Act.

The bortsch "briquets" contain the cabbage, shredded beets and all other ingredients of the red soup that is the Red soldiers' favorite, dehydrated and compressed. All Ivan needs to do is peel off the cellophane covering, soak for 20 minutes in cold water, then boil it up and eat while hot.

Compressed tablets of many kinds of dehydrated foods were demonstrated to representatives of Russian, Chinese, British and other Allied governments, and to members of the Cabinet and the Congress and other government officials. They sat down to a luncheon of soy-bean soup, meat loaf, mashed potatoes, carrots and beet salad, all "reconstituted" from the dehydrated state, and topped it off with custard made from dehydrated milk and dehydrated eggs.

The great step forward which was demonstrated is the compression of dehydrated foods, adding saving in bulk to the great savings in weight already effected by dehydration. For instance, potatoes lose something over 85% of their weight upon dehydration, but still remain rather bulky. Putting heavy pressure on them squeezes out the air that makes the bulk, and reduces the size of the package by another 75%.

Other reductions in bulk obtained by compressing dehydrated foods are: beets, onions, and beef, 65%; carrots, 55%; eggs, 50%; cranberries, 35%; whole milk powder, 30%. Prepared coffee, dehydrated and then compressed, loses 42% of its bulk; one of the little bricks, plus hot water, makes four good cups.

Relatively simple equipment suffices for the compression of dehydrated foods, and much of it can be obtained by the conversion of ceramic tile presses and similar machines now idle. Depending on the type of commodity and the degree of squeezing it will stand without being crushed, pressures used vary from 500 pounds per square inch up into tons per square inch.

Despite being squeezed down past any ready recognition, the compressed dehydrated foods bulk up to normal size and appearance on being soaked in the right proportions of water. Even the cranberries swell up full and round, as if they had come straight from their bogs and had never seen a drier or a press.

Each of the little compressed blocks is individually wrapped in cellophane to exclude moisture, and the blocks are packed in stout cartons of processed fiber board that protect them in handling and discourage hungry insect pests.

Science News Letter, March 20, 1943

PALEOPEDOLOGY

New Science Makes Its Bow: Study of Ancient Soils

➤ A NEW SCIENCE has just made its bow to the world of research. Its name is paleopedology, and it is a member of the family of geological sciences. Its sponsor is Prof. C. C. Nikiforoff, soil specialist in the U. S. Department of Agriculture.

Translated out of its rather formidable-looking Greek, paleopedology means simply the study of ancient soils. It is thus an extension into the past of the already established subject of pedology, or soil science.

Fossil soils, Prof Nikiforoff states (*American Journal of Science,* March) are even harder to find than fossil animals and plants. Although many rocks, like sandstones, limestones, slates and shales, were formed by the solidification of what were originally loose-grained materials, very few of these could be be called soils. For the most part they were laid down as underwater sands and silts, results of the decay and ruin of older rocks and soils. But sometimes deposits are found that were once actual soils, in which plants grew. They were covered up as they stood, by such things as showers of volcanic ash, or lava flows, or glacial deposits, or deep layers of wind-blown loess.

Seldom are these buried deposits

whole soils any longer. As a rule, only the mineral particles, ranging in size from coarse gravel to sand, are all that remain. These have been likened to the skeleton of the soil; they are more or less analogous to the fossilized bones that are usually the only remains we find of extinct animals. Missing is the "flesh" of the old soils—the finer clay particles and the organic humus that form the soil colloids. Missing also is the soil solution—the "blood" of the soil.

Yet despite the skeletonized condition of these fragments of ancient soils, it is possible to make some kind of legitimate inferences regarding the forest floors trodden by the dinosaurs, and the plains where the offspring of little Eohippus grew up into horses.

Science News Letter, March 20, 1943

METALLURGY

British Metallurgists Award Platinum Medal

➤ THE MEDAL of the Institute of Metals has been presented to a former president of the Institute, Dr. Harold Moore, C. B. E., director of the British Non-Ferrous Metals Research Association, a leader in industrial research in England, a communication just received in the United States reports.

The medal is unique in that it is made of pure platinum.

Science News Letter, March 20, 1943

SPACE-SAVING MEALS — These tiny packets contain large quantities of food for shipment to hungry Europe.

PUBLIC HEALTH

DI Men Avert Strike

Scientific detective force from U. S. Public Health Service tracks down the causes of skin diseases in more than 50 war plants.

➤ A THREATENED strike in a Seattle shipyard recently was averted by the DI men of the U. S. Public Health Service, the Office of War Information announced.

The DI men of the federal health service, (DI meaning "dermatoses investigation") are the six doctors specializing in skin disease and the one chemist who, under the leadership of Dr. Louis Schwartz, medical director of the Public Health Service, make up its Dermatoses Investigation Section.

This scientific detective force has tracked down the causes of skin disease threatening to cripple war production and prevented further outbreaks in more than 50 government and privately-owned arsenals and war plants.

Before these doctor-detectives went to work, almost 15% of the workers handling explosives in these plants suffered from some form of industrial dermatitis.

The strike threat in the Seattle shipyard came when electricians who had developed a skin eruption learned that they were working with cable made by a copper company where occupational hazards resulting in some deaths had recently been reported.

Plant officials persuaded the workers to stay on the job until a Public Health Service DI man could arrive to investigate. Dr. Schwartz flew to Seattle, examined the workers suffering from "cable rash" and proved almost immediately that the cause was the chlorinated compound in which the cable was packed. He recommended precautionary measures which were put into practice at once. The strike was avoided and the workers protected.

A unique case recently solved by Public Health's DI men was an unusual skin rash which developed in two State Department clerical employees in Washington. Prior to the rash these employees had been sorting mail from India. The pouch in which this mail had arrived also contained glass tubes of oil samples which had broken and spilled over the documents in the sack. The DI men found by special tests that this oil contained an irritant which had caused the rash.

Government photographers, Navy Yard machinists, Bureau of Engraving printers and building trades' laborers are some of the members of Uncle Sam's wartime force of civil service employees served by Public Health's DI men in addition to industrial plant workers all over the nation.

Science News Letter, March 20, 1943

PSYCHOLOGY

Color-Blind Family

Father and two sons have among them three different types of color-blindness. Father is completely blind to violet end of spectrum.

➤ A FATHER and two sons who among them exhibit all the three known types of color-blindness were described by Dr. Dean Farnsworth of New York University at the meeting of the Optical Society of America in New York.

The father is violet-blind. He confuses violet with yellow, blue with green, and orange with red-purple. One son is red-blind. The other is green-blind.

Violet-blindness by itself is extremely rare. Dr. Farnsworth mentioned only two conspicuous previous cases investigated in this country. One was of quite a different type, he said, and the other was not adequately investigated. However, he believes that violet-blindness is not so rare as generally supposed, that a number of cases have escaped detection because of inadequacy of the color-blindness tests.

Another rare feature of the present case is that the father is completely blind to the violet edge of the rainbow. He

does not see violet light at all. He sees yellow light but it appears colorless to him. The red-blindness and the green-blindness of the two sons are not uncommon among males.

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PHYSIOLOGY—PHYSICS

Ability of Electric Fish To Produce Current Studied

➤ ELECTRIC FISH will hardly power war industries, but knowledge of their "shocking" ability may eventually lead to better understanding of how our own nerves work. New research on these strange creatures has just been reported by Dr. R. T. Cox, New York University physicist. (*American Journal of Physics,* February)

Experiments with three small electric eels were first conducted by Dr. Cox and his associates. When the eels were gently prodded, the scientists' instruments recorded quick electrical pulses as high as 200 volts, lasting about two thousandths of a second. These discharges followed each other in trains of three to five.

Single weak discharges came from the rear half of the eel; one of them always preceding a train of major discharges, probably serving as a warning signal to enemies.

When an eel discharges from fear of enemies or to obtain prey, it serves as an electrical signal for other eels nearby to close in. In fact, the scientists discovered that eels could be called by producing a current in any manner.

When placed in a weak electric current an electric fish swims in the direction of increasing current density, no matter which way the current is going. But in a strong electric current, it swims towards the negative pole.

"This sort of telegraphic communication very likely compensates the electric eel rather well for his partial loss of sight," Dr. Cox states, "the better so in that he commonly lives in muddy water in which the clearest eyes could see no farther than a few feet."

Tests were also made on the largest of all electric fish, *Torpedo occidentalis,* found off the north Atlantic Coast. Measurements revealed a maximum voltage of 220 volts. Peak power of the torpedo was calculated to be a little less than one horsepower per pound of electric organ. These are values for an instant and would be very much less for electric activity over a longer period of time.

Science News Letter, March 20, 1943

FAILURE—This is what happens when a large bird is thrown against a windshield with the speeds encountered in flight. This is a windshield that failed in the test, checking so badly that the vision of the pilot would have been completely obscured.

ENGINEERING

Windshields Duck-Proofed

Tests arranged by Civil Aeronautics Authority show what happens when a large bird is hurled against windshield. Proper shield is developed.

➤ DEAD DUCKS, slammed against airplane windshields at velocities of 300 miles an hour or more, determine the ability of the glass to stand up against actual collision with flying birds in the air, in tests arranged by the Civil Aeronautics Authority.

Planes sometimes collide with ducks, geese, eagles, seagulls and other birds, up to heights of 8,000 feet. The birds' bodies crash through the windshield, and have been known to cause serious accidents. Chances of collision with birds are a special worry of night fliers.

The C.A.A. some years ago interested the National Bureau of Standards in the problem, and preliminary experiments with "synthetic" ducks made of rubber and other substances were carried out in Washington. Later, the project was transferred to the Westinghouse laboratories where manufacturers of the plate glass and plastics used in laminated aircraft windshields collaborated with the C.A.A. in an elaborate research program, using freshly killed ducks and other birds as the missiles. The present "duck-proof" windshields will stop the body of a fifteen-pound bird thrown against it at speeds up to 300 miles an hour or more.

A compressed-air gun with an eight-inch bore and a 20-foot barrel is used. The bird carcasses are weighed and placed in flour sacks. They are then stuffed into the barrel and shot out at speeds simulating flight conditions.

Frosting and icing is prevented by placing a quarter-inch pane of tempered glass in front of the bird-resistant panel with an air space between them. Hot air is circulated through this space. This not only prevents frosting but also keeps the "duck-proof" panel warm, which adds to its strength in resisting impact.

Science News Letter, March 20, 1943

MEDICINE

Promising Cancer Attack

Glandular treatment has resulted in prompt and considerable improvement in nearly all of group with advanced prostatic cancer.

➤ A PROMISING line of attack on cancer, which has helped though not cured a number of far advanced cases, was outlined by Dr. Charles Huggins of the University of Chicago, at the Science Writers' Dinner of the American Society for the Control of Cancer.

"Prompt and considerable improvement" in nearly all of a group of 60 men with advanced prostatic cancer has been achieved by surgical or chemical castration, Dr. Huggins reported.

The first two patients operated on in the three and one-half years since Dr. Huggins devised this method of treating cancer of the prostate are now free of symptoms. Not all, however, have survived. Nearly all enjoyed considerable improvement after the operation for six months, and about one-half are in good condition two years after the operation. Some bedridden patients have gained enough strength to return to work. Pain disappears and morphine may be discontinued usually within several days after the operation.

Chemical castration, alternate to surgical operation, is accomplished by giving doses of female sex hormone.

With either treatment, there is a reduction in the amount of activity of the male sex hormones which seriously interferes with the enzyme systems of prostate cancer cells. Such interference with the enzyme systems of cancer cells seems "to be the most promising line of attack" in cancer treatment, Dr. Huggins stated. The results in treatment of cancer of the prostate, although the method is not believed to be a cure, encourage the hope that this line of attack in future may prove successful in treating all kinds of cancer even in advanced stages.

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Manpower Shortage

➤ CANCER RESEARCH has been greatly slowed down" by the war and a manpower shortage in this field is developing, a spokesman for the cancer control society reported at the meeting.

The most serious situation, he stated, is caused by the loss of technical workers, numbers of whom, who have not gone into the armed services, have been attracted by high wages offered by commercial firms.

Practically no new men are coming into the field and most of the cancer researchers left are giving at least part time to war problems unrelated to cancer.

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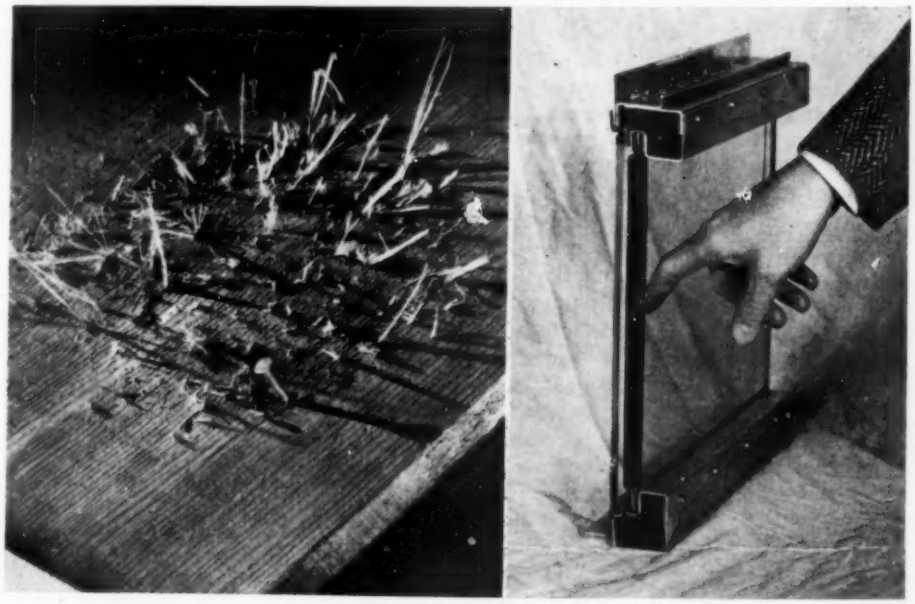

TEST AND RESULT—Straws shot from a gun at a speed of 300 miles an hour against a pine board drove them in as though they were nails as shown at the left. The picture at right shows how a newly developed ice-free and bird-proof windshield is constructed with a space for warmed air between the front pane of glass and the rear plate of plastic. These pictures and the one on the facing page are official photographs of the CAA.

PHYSIOLOGY

Muscle's Relaxation Before It Contracts Is Analyzed

➤ MUSCLE, when stimulated, relaxes a fraction of a hair's breadth in a hair-split fraction of a second before it starts pulling. What happens in that brief interval of time, only about three thousandths of a second, has been analyzed by Prof. Alexander Sandow of New York University.

Using frog muscle in a delicately balanced apparatus of his own invention into which parts of a phonograph and a television set were built, Prof. Sandow learned that this "latency relaxation", as it is called, begins with a period of 1.5 thousandths of a second during which no change occurs. Then the muscle "gives" about one two-thousandth of an inch for about two thousandths of a second. Following this the muscle goes into full contraction.

This period, brief as it is, appears to be one of great importance in the life processes, for during that short time the muscle organizes its stores of energy and "gets set" for the effort that follows.

Prof. Sandow offers a picture of the process, which he emphasizes as strictly hypothetical. The muscle protein, myosin, combines briefly with a complex compound of phosphorus known as adenosinetriphosphoric acid. During this period, about two thousandths of a second, the myosin is made more extensible and this results in the latency relaxation.

During this time the myosin is also splitting the acid and appropriating to itself the energy thus released. The energized myosin then contracts, releasing its energy as work and heat production.

The latency relaxation was first described by a German scientist, Dr. Fritz Rauh, in 1922. Pioneer work in the chemical reactions of myosin was reported recently by a Russian, Academician W. A. Engelhardt, of Moscow.

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PUBLIC HEALTH

Meningitis Cases Reach Highest Number Since 1927

➤ MENINGITIS cases throughout the nation in the past week reached the highest figure for any week since 1927. The total for the week ending March 6 reported by state health officers to the U. S. Public Health Service is 546. This does not include any cases in Indiana, still unreported, but does include 25 delayed case reports from the previous week.

For the first nine weeks of this year the total number of cases has reached about 3,500. This figure, recorded in less than one-fourth of the year so far, is one-third of the total reported in 1929, the biggest meningitis year in Public Health Service records, when a total of 10,551 cases with 4,781 deaths was reported. No figures on meningitis deaths this year are as yet available, but it is believed the sulfa drugs are saving many lives in the present outbreak.

The peak of this outbreak should come sometime this month, meningitis being a winter and spring disease chiefly. Last year, however, the number of weekly cases continued at a high level throughout the summer and early fall. It is impossible to predict whether that will happen this year.

The outbreak is concentrated chiefly in the states along the Atlantic and Pacific coasts.

Influenza, believed by some authorities ready to flare into an epidemic of 1918 scope this year, declined from 5,096 cases the week ending Feb. 27 to 4,290 cases the week ending March 6.

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NUTRITION

Food Composition Group Set Up for the Army

➤ AT THE request of the Quartermaster General of the United States Army, the National Research Council's Food and Nutrition Board has organized a Committee on Food Composition to collect, coordinate and appraise food composition data. Dr. C. A. Elvehjem is Chairman. The Committee is to act as the repository and point of dissemination for authentic data on all foods being used or considered for use by all branches of the Military Services.

Proximate and mineral composition as well as analyses for vitamins A, C, thiamin, riboflavin, and niacin are required as a basis for nutritional evaluation of these foods. Data on new products, processed foods and dehydrated meats, fruits and vegetables especially are needed.

The Committee has already enlisted the cooperation of Federal and State laboratories throughout the country. However, it is also aware that a great wealth of food composition data has been accumulated in the course of research and routine analyses by laboratories.

An appeal is being made to these laboratories of the food industries to make their data active in the war effort. The Committee assures that data received for this purpose will be handled with such reservations as should be exercised in the official utilization of this information by the Armed Services only.

Those having information to offer are requested to address Dr. Paul L. Pavcek, Secretary, Committee on Food Composition, National Research Council, 2101 Constitution Avenue, Washington, D. C.

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MENTAL HYGIENE

Mental Disorders Are Big Problem, New Survey Shows

➤ AN EVER-BROADENING research program to find causes of and ways to heal mental disorders is revealed in a study issued by the National Committee for Mental Hygiene.

The magnitude of the problem is seen from the findings that mental disease "fills more hospital beds in this country than all other disabling diseases combined," and that there is a "great and evergrowing demand for hospital and clinic accommodations for the care and treatment of sufferers from mental and nervous disorders."

Building more and more hospitals is a "defeatist policy" of handling the problem, Dr. George S. Stevenson, medical director of the committee, states. Acceleration of psychiatric research into methods of prevention and treatment is believed to be a better way.

"The initial advance usually seems to be with those private agencies that 'can follow a hunch' on a day's notice, using whatever means happen to be at hand, and that have again and again furnished a stimulus to public progress," Dr. Stevenson said in explaining how the committee, after first studying research in public institutions, made this second study of private mental hospitals and clinics, university and medical school research centers.

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IN SCIEN

ENGINEERING

Standard Specifications Aid War Production

➤ WAR PLANE output is being speeded by the production of aircraft parts by thousands of factories scattered throughout the country. These converted plants are assisted in their war work by the use of standard specifications distributed by the Society of Automotive Engineers.

The specifications include precise engineering instructions covering processes and materials, types, qualities and tolerances. They have enabled widely separated plants to turn out standard aircraft parts which on the assembly line in the warplane factory are used in the assembling of the completed plane.

Metallurgists and material engineers representing the aircraft industries, and Army and Navy officials cooperated in writing the specifications. Some 283 specifications have been completed. Others are in preparation. Nearly half of those originally issued have been revised to meet newer aircraft specifications.

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METEOROLOGY

Chief of Weather Bureau Gets Aeronautics Award

➤ THE CHIEF of the U. S. Weather Bureau, Comdr. F. W. Reichelderfer, has been chosen as this year's recipient of the Robert M. Losey Award, in recognition of outstanding contributions to the science of meteorology as applied to aeronautics. Presentation was made at a dinner held by the Institute of Aeronautical Sciences in New York.

Comdr. Reichelderfer has been head of the Weather Bureau since January, 1939. Previous to that time he had been a meteorological officer in the U. S. Navy. He has been particularly interested in the development of the radiosonde, by which data on upper-air conditions are transmitted automatically from a small sending set attached to feather-weight instruments carried aloft on a small, unmanned balloon.

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NE FIELDS

ENGINEERING—AERONAUTICS

Giant Blimp Hangars Will Be Made From Timber

See Front Cover

➤ FIRE-RESISTANT wood instead of steel is being used to build the giant hangars for the Navy blimps that will appear along America's seacoasts.

The great structures, made fire proof with a mixture of ammonium and boron salts, have arches 17 stories high. They are about 1,000 feet long and 250 feet across. Ten football games could be played at once on the huge floor space—but probably won't be.

The arches will rest on concrete frames 24 feet high.

The doors will be separate structures which can be rolled into place against the front of the hangar, thus overcoming the problem of developing sufficient strength in the roof framing to meet wind pressure. The doors contain the only structural steel used in the entire structure.

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ENGINEERING

New Method of Making Gears Saves Manpower

➤ GEARS FOR TANKS, trucks and other military vehicles are being forged on presses without the usual machining, by a new process developed by Timken-Detroit Axle Company engineers, in Detroit.

Need for scarce machine tools is eliminated and thousands of hours of skilled labor are saved. Former methods required cutting the gear teeth into forged blanks of steel by a generating process, often followed by roughing and finish machining.

About half the steel used when differential pinions were machined from bar stock will now be saved, company officials report. This will amount to more than a million pounds of high-grade steel conserved during the current year from the manufacture of hundreds of thousands of pinion gears.

The process was developed as a result of a modern type forging machine that produces the gears almost as fast as shelling peas from a pod. And the method is so accurate that machining of gear teeth has been eliminated entirely and only three other machine operations are necessary to finish the job.

Increased strength is said to be an additional advantage, stemming from the denser, harder metal structure produced by the forging operations.

Technical details of the process are to be announced at the meeting of the American Society of Tool Engineers on March 27, and complete information is being made available to others manufacturing similar types of gears for military purposes.

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ENGINEERING

Tiny Steel Mill Plays Role in Plane Production

➤ A BABY STEEL MILL is playing an unexpected role in plane production. Used by Howard Scott and William Johnson, Westinghouse research metallurgists, to replace a thermometer maker's dwindling supply of a special metal alloy, it has averted a threatened break in production of gauges.

Originally developed at Westinghouse as a metal sealer for electronic tubes, the alloy known as Kovar was then adopted to measure heat in plane engines and wings by electrical resistance.

War demands depleted the thermometer maker's original supply, which could not be replaced. Sample after sample was tried without satisfactory results. Then the metallurgists went to work, painstakingly measuring the alloy ingredients and carefully cooking the mixture in a tiny electric furnace.

Small 13-pound ingots were turned out and samples from them were closely checked in the laboratory to test electrical resistance. By making minute changes in the ingredients and process the research men finally duplicated the original supply of the special alloy, so that plane-thermometer output can keep pace with the Air Forces' demands. Within a few weeks four suitable ingots were produced.

"A half-dozen ingots of metal with the proper resistance will keep this plant supplied for years to come," Mr. Scott reported. "Each ingot contains enough Kovar to make 56 miles of wire. That's enough wire to make thermometers for 20,000 four-motored bombers."

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PUBLIC HEALTH

Huge Influenza Epidemic Possible in 1943

➤ AN INFLUENZA epidemic like the world-wide one of 1918 is "a very definite possibility in 1943". It could be fought very effectively, however, if the medical profession has enough doctors at the scene of an outbreak to vaccinate enough of the population against the disease to keep it from spreading into an epidemic.

This is the opinion of Dr. Thomas Francis, Jr., of the University of Michigan School of Public Health, who issued a "grim warning to the medical profession and the public" on the influenza situation at the National Conference on Planning for War and Postwar Medical Services held under the auspices of the Carlos Finlay Institute of the Americas.

The great hazard in the influenza situation today, as in 1918, is overcrowding, Dr. Francis states. Great care should be taken, he says, in our huge war production plants where thousands are closely crowded together, working long hours at top speed, so that their resistance is reduced to a minimum. Care should also be taken on crowded buses and trains where a disease such as influenza has an excellent chance to spread.

Vaccines against two types of influenza have been produced and Dr. Francis believes these greatly strengthen resistance to the disease, although he said their real value has not yet been conclusively proved.

Science News Letter, March 20, 1943

INVENTION

New Compact Farm Tractor Invented by Italian

➤ AN ENEMY-OWNED patent held by the Alien Property Custodian is on an unusually well-designed, compact farm tractor invented by Tullio Gavagnin of Genoa; his patent number is 2,310,775. The power is applied at the forward end to a pair of caterpillar-type treads equipped with spikes on each plate to give them better grip on the ground. These treads are relatively short, and they are pulled around wheels arranged in a flat triangular pattern, with a sloping front intended to give a better angle of attack on obstacles.

At the rear there is an axle and a pair of large wheels, over which are the driver's seat, steering wheel and gear shift, much as on the ordinary four-wheeled farm tractor.

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HORTICULTURE

Victory Gardens

Working your own little patch of ground is part of the home front fighter's front-line assignment. Chief weapon should be tomatoes.

By DR. FRANK THONE

➤ VICTORY GARDENS will be planted by everybody this year. It is something to be taken for granted, like buying bonds and war stamps, like salvaging metal scrap and waste fats. It is part of the home-front fighter's front-line assignment.

Make your garden in your own back yard if you can, otherwise join up with your community gardening project and get an allotment in the larger area your neighbors are working jointly.

It is an advantage to do your gardening at home—saves time in getting to work, in a year when there isn't too much spare time at best; saves labor in getting the vegetables from earth to kitchen, and lets the housewife step out at will to harvest a few carrots or enough lettuce for a salad; leaves your own property in better shape for further gardening, or for landscaping if you don't want to keep on raising vegetables after the war is over.

However, before you plump for a garden right outside your own back door, go out and take stock of your prospects. The U. S. Department of Agriculture sets an area of 30 to 50 feet as a minimum, and considers one 50 by 100 feet, or nearly four times as big, as much more desirable. So unless you have at least that 1500 square foot minimum, free of shade, better join the crowd at the community gardens.

Study the Soil

Also, take a good look at the soil itself. If it is like all too many town lots, a mixture of raw clay and cinders, with maybe a generous dressing of brickbats, obviously it won't do. If the ancient Israelites could not make bricks without straw, neither can we modern toilers grow even straw out of bricks. If your soil isn't naturally fertile, or capable of growing your vegetables with the modest amount of fertilizer you will be able to purchase this spring, again better look to the community plot, which has been selected with a special eye to soil fertility.

One very considerable advantage the community project will have: since the land lies all in one piece, arrangements are being made to have it plowed and harrowed, so you won't have the heavy work of spading it up and breaking the big clods with hoe and rake. Spading the good earth is great fun—for the first half-hour or so. After that, it's just plain labor. So it isn't such a bad idea, after all, to let a team or a tractor save your unaccustomed back and leg muscles.

If you don't have the 1500 square foot minimum on your own premises, perhaps a compromise may be possible. Arrange with your community garden leader for as much of an allotment as you can work in about an hour a day (it's really a surprisingly large piece, too, if you stick at it), and use that for your main crops of tomatoes and bush beans and root vegetables. Then spade up a fairish bit of your own back yard for quick garnerings the Missus thinks of at the last minute—green onions, radishes, lettuce, a few bush beans, and by all means a few tomato vines.

Plant Tomatoes

Allot a very generous share of your space to tomatoes. They are by far the most important soldiers in the whole Victory Vegetable army; agreeable to eat, easy to feed to children, easy to put up for winter, rich in vitamins and minerals. Most garden books direct setting tomatoes three or four feet apart. If your soil is rich, or you can get enough fertilizer, you can crowd this a bit and get more tomatoes from your space, by training the plants up to stakes and keeping them pruned strictly back to one stalk apiece. Immigrant gardeners using this method set their tomatoes as close as only two feet apart.

Row distances for some of the most recommended vegetables are: carrots (next in importance to tomatoes), 12 to 15 inches; beets (valuable mainly for their tops), 18 inches; bush beans, two feet; onion sets, 12 inches; lettuce, 15 inches; parsnips, 18 inches; turnips (plant only the yellow kind—rutabagas), 15 inches; spinach, 15 inches.

Don't plan on space-consuming crops like potatoes, sweet potatoes, corn and cabbage, desirable though these may be, unless you have more than the 1,500-square-foot minimum. Their rows have to be about three feet apart—which eats up space most astonishingly. Melons and cucumbers are space-consumers, too, and are hardly worth fooling with because of their relatively low vitamin values. You might plant a few hills of winter squash, in space vacated by the harvesting of early crops like lettuce and onions. They rate as yellow vegetables for vitamin values, and are easy to store, besides.

Better not bother with "fancy" stuff like asparagus, artichoke and Brussels sprouts, unless you have had more than one season of gardening experience—and if you have had that much, you won't be needing to read this article.

Follow Seed Catalog

After you have planned how many feet of each kind of vegetable you want in your garden rows, check up in your seed catalog to find how many packets or ounces of seed you will need to plant them. In the catalogue descriptions, or on the backs of the packets in your neighborhood store's seed rack, you will find statements of the amount of row each will provide. Directions cannot be made more definite here, because the quantity of seed in a packet differs according to variety, cost of production (it's high at present for most seeds), and the individual seed firm's traditional practice.

Don't overbuy. There isn't an oversupply of any kind of seed this year, due to war-caused interruption of our former European supplies; and there is an actual scarcity of some kinds, notably cabbage, onion and carrot.

There's no sense in hoarding seed. Year-old seed loses some of its viability; in some varieties all of it. Moreover, by next spring the supply of American-grown seed will probably be much larger than it is this year. So buy conservatively; leave what you aren't sure you'll need in the store to supply your neighbor's needs.

Victory Gardens will do their best, or less than their best, according to the fertility of the soil into which you drop your seed.

We warned against wasting labor and seed on hopelessly poor soil. But above that starvation threshold there are many levels of fertility, and hence of the amount and kind of fertilizer that can profitably be applied.

It is impossible to give a blanket recommendation on fertilizers. Soils differ too much from region to region, even from one part of a township to another, for such shotgun advice to be valid.

However, a few general considerations may be in order. A soil's natural fertility is roughly indicated by its color. A black soil is usually a fertile soil; a gray soil usually less so. Yellow soils are hard to judge. As a rule, they are less fertile than the darker soils; yet they may be capable of good production if well managed.

Management of a soil includes two groups of factors: mechanical or physical, which are largely a matter of soil texture and tillage; and chemical, which are determined by natural fertility but may be added to by the application of fertilizers.

Best of all fertilizers are the ones nearest nature's own processes in their action, in that they contribute to both physical and chemical betterment of the soil. These are dead plant and animal materials, returning to the dust from whence they came by the natural processes of decay.

Prime choice, if you can get it, is well-rotted stable manure. But getting this is largely a matter of luck—having a riding stable somewhere in the vicinity, or knowing someone who keeps cows. Only a generation ago, manure was a troublesome waste to be hauled away and obscurely dumped, and never to be mentioned by name in polite conversation. Only farmers placed any value on it. Thanks to our motorized age, it is all but unobtainable now; fortunate are the few who can find a supply.

Leaf-Mold Is Good

Next best, among natural fertilizers, is leaf-mold, decayed until little or no trace of fibrous texture remains. It can be found in deep, dank pockets in woodland ravines. Lack of hauling facilities makes this difficult to obtain also, but if you can locate a supply of it, get the consent of its owner, and find a truck to bring it to your garden patch, you have cause for thanks.

You can provide yourself with a supply of humus-making material by setting up a compost heap. This is simply a pile of lawn clippings, dead leaves, vegetable parings and trimmings, and weeds pulled out of your garden, interlayered with an inch or so of soil thrown on from time to time, to hasten the decay process. However, if you didn't set up a compost heap last year or the year before you won't get the benefit of it for this year's garden. It takes time to ripen compost. If you haven't a compost heap now, better get one started right away. The rakings and sweeping you ordinarily burn when you clear up your place in spring can serve as foundation. And now that you're finding it necessary to use more fresh vegetables since canned and frozen ones "went rationed," you'll have more parings and trimmings to add to it. Don't waste anything.

If neither manure, woodland leaf mold nor compost is available, you can fall back on commercial fertilizer. This used to be abundantly available, with manufacturers eager to boost their sales. Now the situation is reversed, because three of the critical ingredients of all standard fertilizer mixtures are also critical war chemicals: nitrogen, phosphorus and potash.

However, the Department of Agriculture and the War Production Board have jointly authorized the use of what has been christened Victory Garden Fertilizer. It is what is known as a 3-8-7 mixture; that is, it contains 3% of nitrogen, 8% phosphoric acid and 7% potash. This mixture is a bit leaner in nitrogen than has been customary in the past, but on the whole it is a very good fertilizer for ordinary garden needs. It is put up by the regular fertilizer producers under their own brand names, and is marketed in bags ranging in size from five to 100 pounds.

It is even possible that you can get along for one year without any fertilizer at all, if your soil is naturally rich and has not raised any crops but grass and weeds for several seasons. Letting land lie idle, or fallow, as it is technically called, has been for many centuries one way of at least partially recovering its fertility.

All that was said here must be taken as suggestions of the most general sort. Fertilizing is a highly local kind of problem, so if you have any doubts it is best to consult your local community garden leader, or at least some neighbor known to be a successful gardener.

Gardens should be well thought out in advance. One element in this planning should be an arrangement of the plants according to their height. In general, the taller plants, like corn and pole beans, should be put at the north or east side, and low-growing plants, like carrots and beets, at the south or west. This insures plenty of sunlight for all.

FOR VICTORY—This young man is contributing his bit toward victory and picking himself a luscious meal in the bargain. Tomatoes are the best of all victory crops.

Whatever you do, be absolutely sure that your tomatoes get plenty of sun, even if it has to be at the expense of some other crop. Tomatoes, it cannot be emphasized too often, are the most valuable single vegetable crop you can raise. You cannot do them too many favors.

As a rule, it is better to plant your garden in long rows from end to end or side to side, rather than in neat, blocked-off individual beds. The row arrangement is most economical of space, and saves labor when the long job of weeding and hoeing comes on with warmer weather. If you have a relatively large plot and plan to work it with a wheel-hoe, of course row-planting is obligatory.

Most varieties of garden seed are available in sufficient quantities for a big gardening season, the U. S. Department of Agriculture advises. It is a touch-and-go situation, for we formerly imported a very large proportion of our seed from northwestern Europe, which, of course, is out of the market for the duration; so we have to grow our own seed now—and even produce a lot for shipment to our overseas allies.

For this reason, both federal and state authorities advise very strongly that each Victory Gardener use the contents of each packet of seeds he opens with an eye to the utmost efficiency. It is a common mistake for first-year gardeners to plant too thickly, perhaps on the naive assumption that since each seed can grow into a plant, that is the way to get the most plants. But overcrowded plants become spindly and must be wastefully thinned if they are to produce a useful crop instead of spending all their strength in futile competition.

Plant, therefore, as if each seed were a cartridge in this critical year's campaign—and you know the ammunition supply is no more than sufficient. Make each seed count. If anything, plant rather more sparingly than directions on the packet call for, and then prepare to weed and tend each individual plant for the highly valuable little ally that it is.

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PHYSICS—MATHEMATICS

Einstein Idea Unworkable

Harvard Mathematician finds famous theory of gravitation unsatisfactory because it does not fit into good explanation of the universe.

➤ EINSTEIN'S FAMOUS theory of gravitation, although it provides a satisfactory explanation of gravitational phenomena is "essentially unworkable," Prof. George D. Birkhoff, mathematician of Harvard University, told a scientific audience at the University of Cincinnati in a lecture which is also being delivered before local chapters of the honor society Sigma Xi throughout the country.

All the newer theories of quantum physics are found inadequate by the the mathematician because they cannot be fitted into a satisfactory explanation of the universe, Prof. Birkhoff indicated.

To the physicist, this larger view of nature seems unnecessary. It is sufficient if he can by means of his theory calculate results that can be verified by scientific experiment.

The mathematician, on the other hand, wants to understand how each theory fits into his whole knowledge of nature. When the theories were not developed from the simple aspects of nature—objects, sequences of events, or geometric forms that can be recognized—but have been created by the human mind, then the mathematician wants to be able to build a physical model to fit the theory.

It is not possible, Prof. Birkhoff indicated, to build any such tangible model from the modern theories of quantum mechanics. It may be true, he said, in some mystical sense that God thinks multi-dimensionally whereas men can can only think in a series of logical steps along a line. We need a satisfactory mathematical theory to remedy our deficiency in this respect.

The way mathematical concepts and theories have been developed from simple experiences of nature was described by Prof. Birkhoff:

"A child puts its hand too near the fire and is burned," he said, "and thereafter remembers that this A (touching fire) will bring about this B (pain and burn). The chain of association fixed in his memory is essentially of the propositional type 'A implies B.' He has learned a physical fact!"

This is the basis of logic.

"The boy playing with a pile of pebbles on the seashore is dealing with a universe of distinguishable objects just as was the shepherd in ancient times who counted his flock by means of stones. In this simple process of one-to-one correspondence lies a basic difference between man and all other animals."

This is the basis for the concept of number.

Geometry arises from the idealization of physical bodies which are taken to be rigid forms and is practiced by the use of such simple "rigid bodies" as the ruler and protractor.

With only these three examples before them, mathematicians have set out to generalize and to modify. More recently they have added the concepts of time and a system of forces. From these have been built the framework of the universe of space and time.

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● RADIO

Saturday, March 27, 1:30 p.m., EWT

"Adventures in Science," with Watson Davis, director of Science Service, over Columbia Broadcasting System.

Dr. Floyd S. Daft, senior biochemist at the National Institute of Health, will discuss "What Are the Chances of Finding New Vitamins?"

Monday, March 22, 9:15 a.m., EWT; 2:30 p.m., CWT; 9:30 a.m., MWT; and 1:30 p.m., PWT

Science at Work, School of the Air of the Americas over the Columbia Broadcasting System, presented in cooperation with the National Education Association, Science Service and Science Clubs of America.

"Races and Nations" will be the subject of the program.

INVENTION

New Method Casts Rotating Bands on Shells

➤ A NEW METHOD for applying the copper rotating bands to artillery shells has been invented by Roy T. Hurley of Dobbs Ferry, N. Y. (patent 2,310,915).

In present practice, rotating bands are made big enough to slip over the base of the shell, and are then squeezed into the groove cut to receive them by a hydraulic or other press under very high pressure. This tends to distort the metal, and may cause failures in action.

In Mr. Hurley's method, the base of the shell is placed in a metal mold that holds it firmly. An annular space in the mold permits melted copper to be poured in, thus casting the rotating band right on the shell itself.

Rights in the patent have been assigned to the Bendix Aviation Corporation.

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ENTOMOLOGY

NATURE RAMBLINGS

by Frank Thone

Misplaced Sympathy

➤ ONE OF THE most popular nursery rhymes, a couple of generations ago, was:

Baby bye, here's a fly,
Let us watch him, you and I—
How he crawls up the walls,
Yet he never falls!

Imagine a present-day nursery jingle calmly assuming the presence of flies in the same room with the baby! And that isn't the whole of it. The next couplet goes on to say:

I believe, with six such legs
You and I could walk on eggs.

Food that flies have crawled on is now regarded as contaminated. Even if the fly has been only on the outside of the eggshell, we have a creepy feeling that that egg can be redeemed only by boiling.

Old-time toleration of the now-intolerable insect is reflected also in an old favorite German lullabye, which despite the war still figures occasionally in recitals in this country. The watchful mother bids her child, "Sleep on; I'm brushing the flies away from you."

All this dates back to a time when flies were considered only a minor nuisance, not as a menace to health, and when our esthetic sensibilities were not disturbed by a widely publicized knowledge of the fly's filthy breeding and feeding habits. When the terrific typhoid incidence of the Spanish-American War in 1898 made us more acutely fly-conscious, the fly soon ceased to be regarded as a relatively harmless, rather interesting insect, and house screens changed from a semi-luxury to an accepted necessity.

So different was the mental attitude of our ancestors toward flies that they actually wasted a good deal of misplaced sympathy on the now repulsive insects. "The Spider and the Fly" was a favorite ballad in the later nineteenth century; and there was a long poem of the temperance-preaching era in which the wicked saloonkeeper was portrayed as a spider and his bemused, befuddled customer as a poor, harmless, foolish fly.

It is worth noting that the literature of the past 25 or 30 years contains practically no reference to flies as innocent or even interesting.

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EXPLORATION

Next Steps for Science In the Study of the Arctic

By PERE ARTHEME DUTILLY

Missionary-Scientist of the Oblate Missions and the Catholic University of America

Excerpt from an address before the Science Talent Institute.

➤ ALL THE PROBLEMS of the Arctic may be regarded for their own sake or in relation to some human need. Personally I prefer to consider them from the point of view of human geography and in relation to man. Bringing them together thus under the aspect of the habitat of the natives, I try to understand their influence upon his customs and ways of life. To understand the life of the inhabitant of the Arctic, the Eskimo, the Samoyede, the Tchuckchi, we must know his country, his geography, his geology, his soils, his climate, his flora and fauna. And it is not certain that polar radiation, winds, clouds and precipitations, glaciers and icebergs, tides and ocean-currents, atmospheric refractions, the magnetic pole and the aurora, are without an influence on the inhabitants of the great polar night and day just as great perhaps as the flora and fauna. But let us pass over all these things and confine ourselves to the flora.

There is a law governing the distribution of population on the globe. This is: A country can contain only as many inhabitants as it can nourish. Now these food resources are essentially vegetable; for man feeds not only on plants but on animals which are nearly all herbivorous. The very true observation has been made that it is not really the reindeer which makes life possible in the high latitudes and severe climate of Asia and North America, it is rather the lichens or mosses which reach those latitudes and which nourish the reindeer. Thus, the Antarctic is not populated, because no plant can grow there. Plants are more dependent than man on the climatic factor. The climate, however, is not the only influence on the life of plants. The nature of the soil has its importance also.

Rather than dwell on the purely climatic classifications, it is therefore more logical to determine the climato-botanical classifications of human life.

Let us leave aside the equatorial zone with its lofty virgin forests and its wild and uncivilized peoples and also the tropical, subtropical and temperate zones and consider only the frigid zone. As one approaches the pole, the forest becomes thinner, the temperature becomes lower, the precipitation less abundant, the soil becomes almost continually frozen and arboreal vegetation becomes impossible. The tree-limit crosses the 70th parallel and reaches 71 degrees north in Europe and Asia, where there are found a few birch-trees or larch-trees; but in Canada the tree limit does not go to the 68th parallel.

North of that there are only grassy spaces, and finally the grass itself disappears before the moss and lichens. A few dwarf birches, which only exceptionally reach 50 centimeters and which have only the name of trees, wind about the surface of soil. It is the domain of the tundra. The vegetation is precarious, but sufficient to nourish a few animals indispensable to man; the reindeer in Canada and Asia; the musk-ox in Greenland, Ellesmere, the Isle of Devon. It thus permits human populations, but only of the sporadic, dispersed kind, condemned to permanent nomadism in order to obtain its indispensable nourishment. In the southern hemisphere, with neither flora nor terrestrial fauna, the Antarctic

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is a frozen domain uninhabited and uninhabitable.

The Arctic is not a whole unit by itself; it is only a zone of the earth. Just as one can not understand our planet completely without studying it as a part of the universe, so one can not grasp the reality and the purpose of the Arctic except in relation to the continent and to the entire globe. The Polar regions have an important part in the economy of the globe. Henri Poincaré, celebrated French scientist, did not hesitate to say that "they are more interesting than all the rest of the earth". In fact, they play a particular part in the physical sciences of every section of the globe. Every branch of physical or natural science, before proposing the solution of its own problem, must put the question "What happens in the neighborhood of the Pole?"

Although nearly entirely explored, the Arctic is not yet known in detail except for a narrow band along its coasts. Our global war and its aviation, penetrating more and more profoundly the Arctic plateau, will discover not only its regions but also its strategic value and will soon make us know it better. Just as the Arctic cannot be separated from the globe and from the universe, so no science furnishes a whole to itself: each of the sciences is merely a section of knowledge or of the universal science on which it depends. Each scientific world has its Arctic zone more or less unkown and unexplored.

It would be the task of each scientist of the new generation to fly over his own table-land, to penetrate it, to explore it, to find its Pole. You will need to have just as much courage, just as much energy and intelligence to reach these polar regions of your sciences as was needed by Peary, Nansen, Nobile, Schmidt and Charcot in the exploration of the polar regions of the globe.

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ENGINEERING

Electronics Provided World With Ignition Rectifier

By DR. JOSEPH SLEPIAN

Associate Director of Research, Westinghouse Electric and Manufacturing Company

Excerpt from an address before the Science Talent Institute.

➤ ABOUT 1930, the use of stainless steel and light metals was rapidly expanding, particularly in transportation equipment, and methods for rapid electrical welding were devised. For welding of such metals it is necessary to use a rapid sequency of accurately measured pulses of electric current, accurately timed. Mechanical switches, because of their inertia, were not practical for controlling these current pulses. It was very natural by this time to turn to electronic science for the answer, and because of the large currents involved, an electro-ionic type of tube was indicated and particularly the mercury arc tube, with its indestructible mercury pool cathode made electron emissive by means of a cathode spot.

However, the only reliable means for starting a cathode spot known at that time was that of mechanically breaking a circuit comprising the mercury pool and an auxiliary electrode, and again mechanical inertia introduced insuperable difficulties. What was wanted was a purely static means for initiating the cathode spot at great frequency and under perfect control.

Electronic science gave a beautiful solution to this problem. A rod of high resistance material was stuck down into the mercury, and current passed down through the rod into the mercury. Analysis of electrical conditions at the junction of the rod with the mercury indicated that there would be there a large concentration of current, and an intense field, just the conditions for starting a cathode spot. Experiment bore out this expectation. Sure enough, when a few amperes passed down the resistance rod, a cathode spot appeared on the adjacent mercury. This could be done as quickly and repeatedly as desired. The small current for thus initiating the cathode spot could be readily handled by a more usual thermionic, grid-controlled, electro-ionic tube. After the cathode spot was formed, thousands of amperes needed by the weld would pass through the mercury arc tube. Thus the ignitron was born. It immediately found wide application in thus electronically controlling the welding of these new materials.

It was then found that the use of this gift of electronic science, the mercury-arc ignitor, permitted a radically new design of the high-power mercury-arc rectifier with a better efficiency and greater reliability than had been attained before. Hence we find that in the great expansion of production of aluminum and magnesium occasioned by the war, the tremendous direct currents needed for electrolysis are being supplied by the new ignitron mercury arc rectifiers.

These examples are only a few of the instances where electronic science is modifying and improving the apparatus of the electric-power industry. We may be quite sure that the next steps in electrical engineering will include further improvements in electro-ionic apparatus, and wider applications.

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Iraq, the traditional site of the Garden of Eden, in normal times exports large quantities of oil and dates.

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• New Machines and Gadgets •

❁ *MOTH PROTECTION for clothes and household fabrics may now be had from a new odorless stainless spray which makes the fabrics non-edible to the insects. One treatment is said to protect the materials for a two-year period.*

Science News Letter, March 20, 1943

❁ *CARROT JUICE cocktail in a cellophane package is one of the latest wartime products. By dehydration a cocktail powder is prepared which contains celery and salt as well as carrots. Packed in moistureproof, airtight, laminated cellophane packages, the product not only saves metal cans, but much weight. Only 2¼ pounds of the powder makes the equivalent of 96 twelve-ounce cans of cocktail juice weighing 103 pounds.*

Science News Letter, March 20, 1943

❁ *NEW ADHESIVE tape recently patented has spaced perforations along its edges so it can be easily torn. Inwardly spaced interruptions in the woven threads also insure that a strip of desired length can be removed with edges smooth and straight.*

Science News Letter, March 20, 1943

❁ *THE ELECTRONIC RAY guns shown in the picture are 300,000-volt X-ray tubes adapted for use by the Army to take X-ray photographs of bullets as they crash through steel armor plate. These pictures, made in a millionth of a second, aid ballistics experts to study the action of bullets in flight. The device is also used industrially to study rapidly moving machine parts.*

Science News Letter, March 20, 1943

❁ *A GRAPHIC calculator has been devised to measure the food value and adequacy of your diet. Amounts of essential dietary elements are registered for each food by raising slides on appropriate scales. When the diet has been completely registered, its degree of adequacy is shown at a glance. The comparative standard can be varied for six types of individuals according to their activities and conditions. Nutrition tables are also included with the device.*

Science News Letter, March 20, 1943

❁ *A NEW AUDIO-SCALE now in use is operated rapidly and accurately by blind persons. Using the principles of the airplane radio beam, the scale gives an audible signal "A" when the scale shows under the correct weight and the signal "N" for overweight. An unbroken buzz signals correct weight. The blind can thus be employed for such work in war plants.*

Science News Letter, March 20, 1943

❁ *TRANSPARENT CELLULOID plastic sheets are being successfully used instead of glass in storm windows in cold regions. It is claimed that the plastic has a lower heat conductivity than glass and transmits and traps more radiant heat from the sun. Also it does not break easily from explosion concussions.*

Science News Letter, March 20, 1943

If you want more information on the new things described here, send a three-cent stamp to SCIENCE NEWS LETTER, *1719 N St., N. W., Washington, D. C., and ask for Gadget Bulletin 148.*

ENGINEERING

Automobile Tires Built To Run Without Tubes

➤ SPECIAL TIRES built to be run without tubes are being tried with success by the Army, it is reported. They are being made by at least one large tire manufacturer. Their use should not be confused with the use of ordinary tires without tubes as an expediency due to the shortage of rubber.

These special tires have an extra-thick inner coating of rubber which prevents the air from seeping through the sidewalls. They also have extra-stiff, thick sidewalls to make them bullet-sealing and strong enough to run flat if torn by shell fragments.

They are not practical for private cars at the present time. The extra amount of rubber needed for the inner surfacing is more than enough to make tubes. In post-war days a tubeless tire may be developed which will be put to general use.

Tests are being made in using ordinary tires without tubes but time will have to elapse before it will be known if the plan is fully successful. It was first suggested by the War Transportation Committee of Tulsa, Okla. An experiment is being tried in that city on 150 cars. Other trials are being made in other places.

The National Bureau of Standards is testing inflated casings without tubes in the laboratory, but not as yet on the road. Tires and rims were removed from cars. The insides of the tires were thoroughly cleaned and examined for breaks. Truck valves were inserted in the valve holes on the rims. The casings were then carefully placed on the rims so that they would fit as tightly as possible and a quart of an asbestos sealing fluid added to each through the valves. The wheels were spun rapidly to distribute the sealing fluid, and the tires were filled with air.

The outcome of these trials is still uncertain and tests over a longer period seem advisable before the plan is adopted on a nation-wide basis.

Science News Letter, March 20, 1943

Benjamin Franklin in 1785 published an article on the cause and cure of *smoky chimneys* that is still quite up-to-date.

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First Glances at New Books

➤ REFLECTIONS of a physicist on some of the problems of philosophy make stimulating reading in PHYSICS AND PHILOSOPHY by Sir James Jeans (*Macmillan*, $2.75). He explores the territory between physics and philosophy, opened up by the work of men like Planck, Rutherford and Einstein. The style of this lively discussion is as simple as his subject permits.

Science News Letter, March 20, 1943

➤ TODAY'S WAR demands a better knowledge of the ways of the air (which is weather) than most cadets possess when they come to training school. To facilitate instruction Lt. C. W. Barber, U.S.N.R., of the Aerographers' School at Lakehurst, has prepared a compact, practical text under the title, WEATHER SCIENCE (*Pitman Publ. Corp.*, $2.50). It is worthy the consideration of any teacher who must now offer a course in beginning meteorology

Science News Letter, March 20, 1943

➤ TOM WINTRINGHAM, one of the most acute of contemporary English military writers, gives us in THE STORY OF WEAPONS AND TACTICS, a group of essays on the evolution of military weapons, and with it the evolution of tactics which they largely compelled. His subtitle, "From Troy to Stalingrad," gives us a picture of the scope of the volume, as well as of its up-to-dateness (*Houghton Mifflin*, $2.25).

Science News Letter, March 20, 1943

➤ RECENT ADVANCES IN AMERICAN ARCHAEOLOGY is a rather prosy title hiding under its bushel some most interesting lights that illuminate new spots in this continent's remote past, all the way from Eskimo country to the Mayan area. The chapters consist of papers presented before the April, 1942, meeting of the American Philosophical Society by a number of leading workers. (*Am. Phil. Soc.*, $1.)

Science News Letter, March 20, 1943

➤ MATH for the layman from simple arithmetic to complex algebra is clearly presented in WARTIME REFRESHER IN MATHEMATICS by Lt. W. C. Eddy, A. H. Brolly, Ensign E. S. Pulliam, E. C. Upton and G. W. Thomas (*Prentice-Hall*, $1.40, *text ed.* $1.05). From experience at the U. S. Naval Training School in Chicago, the authors keyed their book to today's practical problems. Cues are included with problems to show proper methods of operation and detailed solutions eliminate bad work habits at the source.

Science News Letter, March 20, 1943

➤ COPPER, the red war metal mined in upper Michigan, created the first mining boom in the United States. This saga of a by-gone era is told in Angus Murdoch's BOOM COPPER (*Macmillan*, $3). Although much of the copper range has not been fully explored even today, the author gives critical comment on why present demands have not revived the boom in the Michigan copper area.

Science News Letter, March 20, 1943

➤ AMERICA, becoming suddenly much more sea-conscious, begins to remember some of the long-dusty names of men who sailed her ships in her first period of sea greatness, a century and more ago. In MASTER MARINER, James B. Connolly (*Doubleday, Doran*, $3) gives us the story of one of the pioneers of our East India trade (and a geographer and naturalist to boot) who was an early bearer of a well-known name: Amasa Delano.

Science News Letter, March 20, 1943

➤ A HANDBOOK of SUBSTITUTES by H. Bennett (*Chemical Publishing Co.*, $4) contains a list of chemicals, metals, fibers and others products useful to the commercial producer in these days of shortages. A plan for proper choosing is included. For those with highly specialized needs, the book will serve as a starting point from which a specific solution can be "imagineered."

Science News Letter, March 20, 1943

➤ CREATIVE genius of a country boy who rose to rule an industrial empire is portrayed in the biography of GEORGE WESTINGHOUSE: FABULOUS INVENTOR by H. Gordon Garbedian (*Dodd, Mead & Co.*, $2.50). The industries he founded still turn out products ceaselessly, many now converted to war production.

Science News Letter, March 20, 1943

➤ SPIRITUALS are commonly thought of as documents of American Negro ethnology and psychology only. There is, however, a less known literature of religious folk music, stemming back to rural northern England, which was transplanted into the Colonies and which still has some survivals. George Pullen Johnson gives us a good collection of these songs in DOWN EAST SPIRITUALS AND OTHERS (*Augustin*, $5.50).

Science News Letter, March 20, 1943

• Just Off the Press •

ANATOMY AND PHYSIOLOGY LABORATORY MANUAL AND STUDY GUIDE — Barry Griffith King and Helen Maria Roser — *Saunders*, 253 p., illus., $2.75. 2d ed., revised.

A COURSE IN RADIO FUNDAMENTALS: Study Assignments, Experiments and Examination Questions based on The Radio Amateur's Handbook—George Grammer—*American Radio Relay League* — 104 p., illus., 50c. With the Handbook, this little booklet contains all you need for a home-study course in radio leading to the Amateur's License, stepping-stone to many important war jobs.

THE ECOLOGY OF THE ORTHOPTERA AND DERMAPTERA OF THE GEORGE RESERVE, MICHIGAN—Irving J. Cantrall—*Univ. of Michigan Press*, 182 p., 10 plates, 2 maps, $1.50. (Miscellaneous Publications Museum of Zoology, University of Michigan, No. 54).

THE ELEMENTS OF AEROFOIL AND AIRSCREW THEORY—H. Glauert—*Macmillan, Cambridge Univ. Press*—228 p., illus., $3.50.

FOOD CHEMISTRY AND COOKERY—Evelyn G. Halliday and Isabel T. Noble — *Univ. of Chicago Press*—346 p., illus., $3.

GEOLOGY AND MINERAL RESOURCES OF THE MARSEILLES, OTTAWA, AND STREATOR QUADRANGLES — H. B. Willman and J. Norman Payne—*State of Illinois*, 388 p., illus., 29 plates, $1. (State of Illinois Division of the State Geological Survey Bulletin No. 66.)

MAPS AND SURVEY—Arthur R. Hinks—*Macmillan, Cambridge Univ. Press*, 301 p., illus., $3.75. Fourth edition.

MEN AND WINGS—Assen Jordanoff—*Curtiss-Wright Corp.*—94 p., illus., 50c. A brief, interesting, and well-illustrated history of aviation.

PHYSICS & PHILOSOPHY—James Jeans—*Macmillan*, 222 p., $2.75.

PRACTICAL MARINE DIESEL ENGINEERING —Louis R. Ford — *Simmons-Boardman*, 642 p., illus., $6. 4th ed. This edition limited to American Diesels and engine types now being used in present day ships.

PRINCIPLES OF ELECTRICITY—Wendell H. Cornetet and Daniel W. Fox—*McKnight & McKnight*, 255 p., illus., $1.60. (Related Shop Science Series.) A semester course in preinduction training.